



U.S. Department of Energy Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy
is clean, abundant, reliable, and affordable

INDUSTRIAL TECHNOLOGIES PROGRAM

Improving the Energy Efficiency of Pump Systems

Pumping System Assessment Tool (PSAT) Saves Energy

PSAT software uses data that are typically available or easily obtained in the field (e.g., pump head, flow rate, and motor power) to estimate potential energy and dollar savings in industrial pump systems. The software is available *without charge* from the U.S. Department of Energy for evaluating industrial pump systems.

Pump Prescreening

Use the PSAT prescreening filter to identify areas that are likely to offer the greatest savings. Look for symptoms associated with inefficient energy consumption:

- Throttle-valve control for the system
- Cavitation noise or damage in the system
- Continuous pump operation to support a batch process
- Constant number of parallel pumps supporting a process with changing demands
- Bypass or recirculation line normally open
- High system maintenance
- Systems that have undergone change in function

Quantifying Potential Savings

PSAT identifies energy savings *opportunities* in pumping systems and quantifies those opportunities in both dollars and electrical energy savings. Although PSAT does not tell *how* to improve systems, it does prioritize attractive opportunities and supports broader or narrower searches for improving efficiency.

PSAT assesses *current* pump system operating efficiency by comparing field measurements of the power delivered to the motor with the fluid work (flow and head) required by the application. It estimates a system's *achievable* efficiency based on pump efficiencies (from Hydraulic Institute standards) and performance characteristics of pumps and motors (based on the MotorMaster+ database). Subsequent comparison of the actual and achievable efficiencies distinguishes systems with lower levels of opportunity from those that warrant additional engineering analysis.

"PSAT has proven to be a versatile, straightforward tool for quickly assessing the optimization potential in an existing pumping system. Many engineers in our organization have taken the DOE-produced training to become Qualified PSAT Specialists, and we have been successful using the tool to demonstrate savings opportunities to our customers."

Gunnar Hovstadius, Ph.D.
Director of Technology
ITT Fluid Technology
Qualified PSAT Specialist



Use PSAT to perform the following key functions:

- Establish system efficiency.
- Quantify potential energy savings.
- Examine the economic and energy impacts of different operating scenarios.
- Provide data for trending system performance.
- Clarify impacts of operational changes on demand charges.
- Identify degraded or poorly performing pumps.

To download the Pumping System Assessment Tool (PSAT) and other free software tools or participate in an on-line tool forum, visit us at:

www.eere.energy.gov/industry/bestpractices/software.html

To learn more, contact the EERE Information Center (1-877-337-3463) or visit the BestPractices web site at www.eere.energy.gov/industry/bestpractices

PSAT Gets Results

Large savings may come from one large application or process, but may also develop from multiple small applications that, when combined, keep total consumption low enough to avoid increased utility charges based on threshold demand.

At a gold mine, the PSAT prescreening filter identified three pumping systems for further analysis. Over \$170,000 per year (2,398,200 kWh) in potential savings were identified.

Prescreening at a paper mill identified one system that presented a significant energy savings opportunity. The identified potential savings of more than \$64,000 per year (2,252 MWh) were traced to inefficient operating practices rather than pump degradation.

Smaller facilities are not exempt from energy savings. An aluminum rolling mill applied PSAT to four related systems and identified over \$38,000 per year (1,015,000 kWh) in potential savings.

A pumping system assessment for an Alcoa plant in Pennsylvania identified savings in three systems. After prescreening, a PSAT analysis of the three systems identified \$110,000 per year in potential savings.

A USX steel mill employed PSAT to examine its hood spray application that used bypass flow control. The mill discovered an opportunity to save \$41,700 per year and use 13% less energy. The bypass flow control set-up was replaced with a properly sized pump and energy-efficient motor that would be operated only when productive.

Industry (No. of Assessments)	Average Energy Savings (Million Btu/year)	Average \$ Savings (Annual)
Aluminum (2)	1,882,500	\$74,400
Chemicals (1)	1,601,200	\$106,000
Forest Products (7)	4,717,400	\$186,500
Mining (7)	9,419,100	\$410,700
Petroleum (2)	1,150,000	\$46,000
Steel (2)	5,787,500	\$231,500

"PSAT identified a significant energy savings opportunity in one of our large water circulation systems. We were impressed with DOE's willingness to help and with their assessment capabilities."

Jeff Hackworth,
Energy Manager,
Rohm and Haas Texas Inc.
2003 Texas Technology Showcase

"For many industrial facilities, the energy consumed in pumping fluids comprises a large fraction of total energy consumption..."

PSAT provides a relatively simple indication of effectiveness by estimating the work done by the pumping system and compares that to the estimated energy input into the system."

Robert Asdal,
Executive Director
The Hydraulic Institute
Hydraulic Institute Press Release,
August 2000

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

For more information contact:
EERE Information Center
1-877-EERE-INF (1-877-337-3463)
www.eere.energy.gov



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